

Quantitative Risk Analysis for Wreck Removal Contracts

Part 1: A Salvage Consultant's Perspective

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Note: This is the first article written by the author to assist stakeholders in the marine salvage and wreck removal industry to understand and properly implement Quantitative Risk Analysis when confronted with a wreck removal project of significant size and complexity. The series is called Quantitative Risk Analysis for Wreck Removal Contracts. There are plans for additional articles in the series.

Introduction

Quantitative Risk Analysis (QRA) is a common practice in many industries related to wreck removal including shipping, oil & gas and offshore wind. QRA has now been implemented on several large wreck removal projects (www.wreckrisk.com). This article provides a practical outline of how the QRA process works for wreck removals, addresses some of the misconceptions surrounding the QRA process and provides several examples how the process has been successfully employed.

Old school wreck removal tendering

After 20 years on the contractor's side of the table, my first real experience reviewing contractor proposals was enlightening. I was instructed as a Salvage Consultant by a member of the International Group. I was part of a review team whose task was to advise the client of our preferred contractor for a major wreck removal. Bids were received from all the major salvage contractors. Having written and submitted countless wreck removal proposals as a contractor, it was interesting to see the process from the other side of the table.

Contractors had obviously put in a lot of time and spent significant sums of money to prepare their proposals. All the contractors delivered their proposals in person. Each contractor showed up with at least four large binders. Proposals were delivered with costs included in one set of binders and excluded in the other. It was obvious that hours had been spent just printing, numbering pages and collating.

All the proposals were formatted and organized in different ways. The proposals included pages of unnecessary information such as company history, HSE policies and CVs for personnel that may or may not work on the project. Methodologies were detailed in some sections, vague in others. Timelines were very basic, were focused mainly on milestones and not structured into manageable tasks for proper project management. There was very little justification for the duration of many tasks. Costs were not clearly identified. Some of the proposals contained a very basic *qualitative* risk assessment focused on internal operations and excluding the more significant project risks required for the stakeholders to understand their true overall exposure. The offers were universally subject to final contract terms and conditions, the idea being that nothing is really settled until we are sitting at the negotiation table. Good for the savvy commercial managers, not necessarily the best for the insurer or the project.

It was extremely difficult to compare one proposal to another and select the preferred contractor. There were different methodologies to be employed and a wide range of commercial offers. How does one compare a WRECKHIRE offer with an optimistic timeline to a WRECKSTAGE offer with a well-padded schedule? While this tender was never awarded, the contract would likely have gone to what was subjectively agreed by the review team as the lowest bidder with a reasonable plan. The losing bidders would not have an opportunity to explain their offer and would likely never know why they were not selected. The insurer would never have known their true exposure.

I have now had several opportunities to participate in tenders using Risk Based Contracting based on applied QRA. This was done in cooperation with CL Risk Solutions, using their xpoSure© software, along with a team of other consultants and solicitors. The insurers have been major P&I Clubs and underwriters. The contractors have included most of the international wreck removal contractors, heavy lift contractors and waste management contractors. All the projects were completed on budget and, more or less, on time. The insurers had the certainty they desired and the contractors were profitable, as it should be. Here are my reflections.

What is QRA?

According to Det Norske Veritas, QRA is “...a formal and systematic approach to estimating the likelihood and consequences of hazardous events, and expressing the results quantitatively as risk to people, the environment or your business. It also assesses the robustness and validity of quantitative results, by identifying critical assumptions and risk driving elements.” Similar QRA citations can be found on most of the classification society websites.

In more simplistic terms, QRA is a process which drills down into a contractor’s proposal to:

- Identify the risks
- Determine the cause and effects of each risk
- Develop a mitigation strategy for each risk, including specific Risk Control Measures to manage each risk before and during project execution
- Quantify the risks
- Allocate each risk to the stakeholder who is best able to manage that risk

This process results in a Risk Forecast for each contractor. The Risk Forecast gives the contractor a comprehensive basis for their commercial proposal. It provides the insurer with a more relevant apples-to-apples comparison of the various proposals submitted in terms of the insurer’s overall exposure for each contractor. This can be very difficult if not impossible to do using a more subjective approach on a complex wreck removal.

QRA is not an attempt to force a contractor to take all the project risks for a consultant calculated lump sum price. The contractor is free to take risks or to hand them back to the insurer, a process known as Risk Sharing. The contractor’s final offer is a combination of their own Baseline Costs, including uplifts and profit, and a Risk Premium paid by the insurer at levels the contractor chooses depending on the risks they accept and the confidence they have in their own plan. There may also be components of the project that are paid on a daily hire rate, per tonne rate, standby rate, bonuses etc. There are no limits to what the contractor can propose and it can all be included in the Risk Forecast.

Casualty Management Team

The QRA process is most effective when administered by a Casualty Management Team (CMT) assembled by the insurer. The CMT generally includes the following:

- Insurer’s Claims Handler
- Risk Engineer
- Salvage Consultant
- Insurer’s legal representative
- Insurer’s local correspondent

The final makeup of the team may be smaller or larger depending on the complexities of the project. CMT members may work on a full-time basis or participate as needed. Additional experts for things such as engineering, environmental impact, spill management or waste management can be consulted as needed.

Developing the Risk Register

The QRA process begins with the Invitation to Tender (ITT). The ITT must be very clear on how the QRA process will be implemented and how the contractor selection process will be done. An ITT intended to utilize the QRA process requires the contractor to focus on only four things:

- Methodology

The Methodology should be succinct and no more than 20 pages for a typical wreck removal, excluding tables, drawings or calculations. Engineering should demonstrate a “proof of concept” for the proposed methodology. Contractors are encouraged to include things like relevant past projects and CVs for the upper-level project management team. Unnecessary items such as company history, HSE policies, etc. should be made available via links to the contractor’s website.

- **Baseline Schedule**

Gantt charts provided by contractors are not typically sufficient for proper risk management. Contractors are encouraged to break their Baseline Schedule into tasks that can be managed with appropriate durations assigned. Durations can include reasonable allowances in which the duration may float. For example, a task may be assigned a three-day duration with a possibility of being completed between two and six days. This is referred to as the task's Workability Uncertainties. It is a convenient way for the contractor to deal with scheduling uncertainty, an inherent and significant risk of any project. This allows the Contractor to account for the uncertainty of assigning a duration to, for example, a one-off task to be done by divers in strong currents and zero visibility. The Baseline Schedule is reviewed and agreed during each of the contractor interviews and modified as necessary for entry into xpoSure.

- **Baseline Costs**

Ideally contractors will reveal detailed costs organized to reflect the daily burn rate for the various phases of their proposal, including uplifts and profits. Contractors are not always eager to detail their costs and it is at their discretion on how detailed they would like to be. An elementary breakdown of the costs is necessary to correlate Baseline Costs with the Baseline Schedule and corresponding risks. Baseline Costs are reviewed and agreed during each of the contractor interviews and modified as necessary for entry into xpoSure.

- **Risk Register**

The contractor is instructed to identify risks that will significantly affect the project costs or timeline. Risks such as "slips, trips and falls" are not required. The Risk Register for a typical wreck removal will include at least 25 risks and generally no more than 50. The ITT provides a Risk Register Starter Kit with suggested Risk Areas and a few generic risks for those contractors that may not be experienced with producing a comprehensive Risk Register. The Risk Register is reviewed and agreed during each of the contractor interviews and modified as necessary for entry into xpoSure.

These four items are all that is needed for proper risk assessment and project management. Focusing the contractors on these four items gives them more time to work on the deliverables that are most important.

Suggested Risk Areas for the Risk Register include, but are not limited to:

- Project Management
- Engineering & Work Preparations
- Operational
- Subcontractor Interface
- Supply & Logistical
- Law & Regulations
- Finance & Tax
- Health & Safety
- Workability
- Environmental & Meteorological
- Political/Security

The Risk Register can, and should, include risks for "black swan" events such as a COVID-19 pandemic, regional political instability or the worksite being hit by a major hurricane during the annual hurricane season.

The contractor has direct control over some of the more technical and operational Risk Areas and is the party best able to manage the related risks. The insurer will normally expect the contractor to accept these risks and manage them accordingly. If the contractor does not wish to take a particular risk from these Risk Areas, the contractor can give the risk back to the insurer. The contractor's willingness to take risks from these Risk Areas gives the insurer some measure of how confident the contractor is in their own proposal, their Risk Mitigation Strategy and their specific Risk Control Measures as discussed below. The contractor will demonstrate less control over many of the remaining non-technical Risk Areas. It is more likely that the contractor will give some of these risks back to the insurer. This does not exempt the contractor from managing these risks for the insurer throughout the project execution.

A Risk Premium will subsequently be calculated for the contractor based on the technical and non-technical risks that they agree to take. The Risk Premium is the amount of money the insurer agrees to pay the contractor for taking the risks they do. The Risk Premium is paid in addition to the contractor's own Baseline Costs. If the contractor accepts a risk, they get paid to do so.

Down in the weeds

Like all modelling processes, it is imperative that the Baseline Schedule, Baseline Costs and the Risk Register are addressed correctly. Interviews between the CMT and the Contractor during the tendering phase make sure this information is complete and correctly organized. These day long interviews involve a "down in the weeds" review of the contractor's proposal, including a discussion of all the perceived risks. Risks are added and scored as discussed below. These interviews are, in essence, part of the contract negotiations and legal counsel for both sides must be fully aware of these discussions as they will ultimately become part of the contract. Legal representatives from both sides are encouraged to attend the interviews.

The interviews require two important things. The first is that the contractor must be willing to discuss the details of their proposal including those things which worry them the most i.e., the risks. The second is that the members of the CMT must be sufficiently patient, knowledgeable and experienced to encourage an open dialogue with the contractor and understand in detail the contractor's proposal.

Several interesting things have been observed during these interviews. Contractors are not eager to discuss their project risks as these are considered to reflect the negative aspects of their proposal. This is not a suggestion that any one contractor would intentionally hide something, but if the contractor is not asked then they are not likely to tell. It takes a while for the contractors to get comfortable discussing their risks. Most interviews begin slowly and warm up as the day goes on. Reluctant contractors at 0900 speak more freely at 1430. This has to do with the contractor's trust in the CMT and their understanding of how the process works. The contractor's proposal is consistently improved during this intensive review process and the insurer's understanding of the contractor's proposal is much more comprehensive.

During the interview each risk is identified, mitigation strategies are developed and the risk scored. There is an *Initial Risk Score* and a *Residual Risk Score*. The Initial Risk Score includes risk identification, causes and effects without further mitigation. The Initial Risk Score is then agreed between the parties for:

- Initial Probability of that risk occurring (p)
- Initial Cost effect (direct costs) if that risk occurs (C)
- Initial Time effect (delays) if that risk occurs (T)

The parties then discuss how the contractor will mitigate the risks. The contractor is requested to include specific Risk Control Measures (i.e. action items) they will do during the execution of the project to implement their overall Mitigation Strategy for that risk. The Residual Risk Score is then agreed to reflect the mitigation strategy implemented for:

- Residual Probability of that risk occurring (p)
- Residual Cost Effect if that risk occurs after mitigation (C)
- Residual Time Effect if that risk occurs after mitigation (T)

Risks are scored on three things: Probability (p), Cost Effect (C) and Time Effect(T). The scoring is referred to as the pCT. The intent is that the contractor's Mitigation Strategy will reduce each of the pCT scores. In some cases, the risk is easily mitigated and all three Residual Scores are reduced. In other cases, one or more of the scores may remain unchanged despite the contractor's mitigation efforts.

For example, there is not much a contractor can do to lower the probability that a major hurricane will affect the work site during hurricane season. The Initial and Residual scores for the probability of a hurricane affecting the work site will always be the same. It is possible that an effective Hurricane Contingency Plan, part of the contractor's Mitigation Strategy to return to work in a timely manner after the hurricane passes, can significantly reduce the Residual Cost and Time Effects for this risk. While the contractor will understandably give the Hurricane Risk back to the insurer, they are still expected to mitigate the insurer's risk. In this example, the risk is shared and the insurer's overall exposure is reduced by the efficacy of the contractor's Hurricane Contingency Plan. All things being equal, the contractor with the best Hurricane Contingency Plan comes out ahead. This can all be captured in the Risk Register and subsequent Risk Forecast. If the Hurricane Risk scores are unacceptable to the insurer, it is also possible that the parties agree to reschedule the project until after Hurricane Season, a rather effective Mitigation Strategy.

The pCT scoring is not an exact science. There can be differences in how the contractor and CMT perceive a certain risk. There is some level of give and take in the process. Different contractors can have the same risk but score it differently. One contractor may take a risk and another give it back to the insurer. The important point is that the risks are understood, an effective mitigation strategy is developed and the Initial and Residual pCT scores are agreed by both sides in an open risk dialogue. Competition keeps the contractor from intentionally scoring the risks too high or giving all the risks back to the insurer. The iterative risk dialogue will prevent the contractor from intentionally scoring the risks too low in his eagerness for the job.

There can be upside risks as well. These are known as Opportunities. They are risks which provide a reduction in Cost or Time Effects if the Opportunity occurs. An example of an Opportunity could be that horizontal directional drilling (HDD) may not be necessary to install all the required lifting chains. The ability to run messenger a wire without HDD in some locations will save the contractor three days on the critical path per chain. This may occur due to higher-than-expected scouring rates at the bow or stern of the vessel or an uneven seabed which provides a gap to run a particular chain. The Opportunity is entered into the Risk Register to show that the Contractor's proposal may have a chance of finishing earlier than expected.

Risks can also be scored for other metrics. These include Health, Safety, Environmental, Security, Quality and Reputation (HSESQR effects). For example, it might be useful to include Environmental Risks and score the contractor's proposal for its environmental impact. Two Risk Forecasts could be run for the same proposal. One forecast would be for the inclusion of a cofferdam around the wreck to contain pollutants and the other without the cofferdam. Comparing the two forecasts, in terms of time, cost and environmental impact could be used to justify the preferred option to the local authorities, other IG members and even the re-insurance market if necessary. Allowing the local authorities to participate in the scoring of the environmental risks may help facilitate their final approvals and speed up the permitting process. The QRA process can also be used to evaluate ESG and Sustainability issues that are sure to become a consideration with future wreck removal projects.

How to read an xpoSure risk forecast?

It is not the intent of this article to explain the mathematics involved in the QRA analysis nor to explain in detail all the useful information provided in the forecast. Here are the basics. In a Risk Forecast the work method proposed by contractor is modelled and fictitiously executed 10,000 times to predict the impact of normal uncertainties and project risks on the expected schedule and cost performance. In each iteration values are drawn randomly from task duration, cost element uncertainty ranges, risk probability and risk effect distributions. The sum of combinations of these risks and uncertainties, which differs for each iteration, is the basis for each of the 10,000 datapoints of the resulting time and cost overrun distributions.

In the Initial Risk Forecast the following inputs are used:

- **Baseline Schedule** including baseline task durations, relationships and critical paths
- **Baseline Costs** attached to individual tasks or groups of tasks, fixed or time phased
- **Normal Uncertainties** including workability, quantity and cost uncertainties
- **Risk Register** including probability, cost effect and time effect ranges

General outputs from a Risk Forecast include:

- Overall distributions for expected time shift (delay on baseline) and cost shift (expected extra cost on baseline). With reference to baseline performance (including mean workability and excluding risk) interesting metrics in an overall risk distribution for time and cost are typically:
 - **Expected Mean** – The overall duration and cost (overrun) which is most likely to occur, taking into account the average sum of combinations of all the uncertainties, risks, opportunities and indirect (time phased) cost effects, on top of the baseline schedule and cost estimate.
 - **90% Certainty of Not Exceeding (p90)** – The confidence level at which there remains only a 10% likelihood that there will be additional time and cost overrun.
 - **Relative Uncertainty Ratio (RUR)** – The ratio between the project time or cost uncertainty range and the baseline time or cost.

- Sensitivity analyses showing the largest uncertainty and risk contributors to the risk shifts. The sensitivity analysis is expressed in the form of a tornado diagram (Figure 2). Cost and time sensitive risks and uncertainties occur in the top of the diagram, which is aimed at setting focus on high priority areas for immediate risk mitigation.
- The underlying register of quantified risks, including risks which could cause a material change, a change of method or a temporary work stoppage, which are not (or not fully) reflected in the risk profile and requires separate attention and risk dialogue.

Figure 1 is the best summary of what the xpoSure Risk Forecast reports can provide. The x-axis represents the Expected Cost Risk Shifts. Positive x-axis values represent the costs above the contractors Baseline Costs. The light grey y-axis (values 0 – 8.5%) represents the frequency calculated out of 10,000 iterations for a given cost overrun level (an individual bar in the histogram chart). A similar graph is produced representing days instead of dollars.

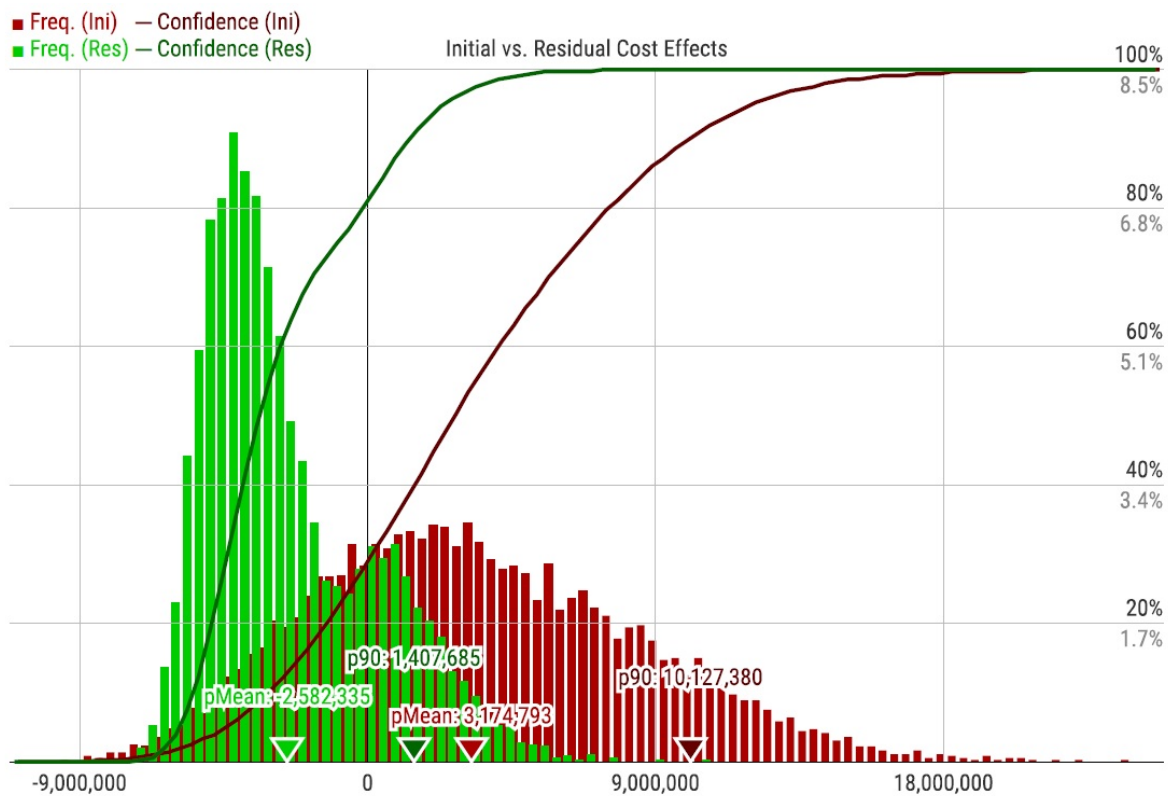


Figure 1 – xpoSure Risk Forecasts – Initial vs. Residual Risk Distributions and cumulative S-Curves

The red plot represents the simulation for the *Initial* Risk Scoring (no additional risk mitigations implemented). The green plot represents the same for the *Residual* Risk Scoring (after the risks have been mitigated). The shift of the residual distribution to the left (risk reduction) and a narrowing of the plot (increased risk confidence) reflects the efficacy of the contractor’s mitigation of the risks they have accepted.

The S-curve is plotted against the black y-axis (values 0-100%) and represents the certainty or confidence level that the project will be completed for the corresponding value on the x-axis. For example, p50 represents a 50% certainty that the project can be completed for the number of additional dollars shown on the x-axis above the contractor’s baseline costs. Likewise, p90 represents a 90% certainty for the same. In Figure 1, the Residual p90 Risk Premium is an additional \$1.4 million dollars above the contractor’s Baseline Costs.

In practice, contractors are asked to consider the Residual (green) p90 value as the starting point for determining the Risk Premium they will request for the risks they have accepted. Contractors are free to bid above or below the p90 number depending on the confidence they have in their own proposal or how competitive they need to be to win the project and still make a reasonable profit.

Figure 2 shows the risks and uncertainties that are the most sensitive to the overall time-phased cost shift of a project, i.e., of risks causing time delay and subsequently causing additional project costs. The first eight risks account for up to 25% of the predicted time-phased cost shift. Like the critical path in a Gantt chart, the

contractor is encouraged to concentrate on the risks that have the biggest impact on the project timeline. Figure 2 and other similar outputs are excellent tools for focusing the efforts of the contractor.

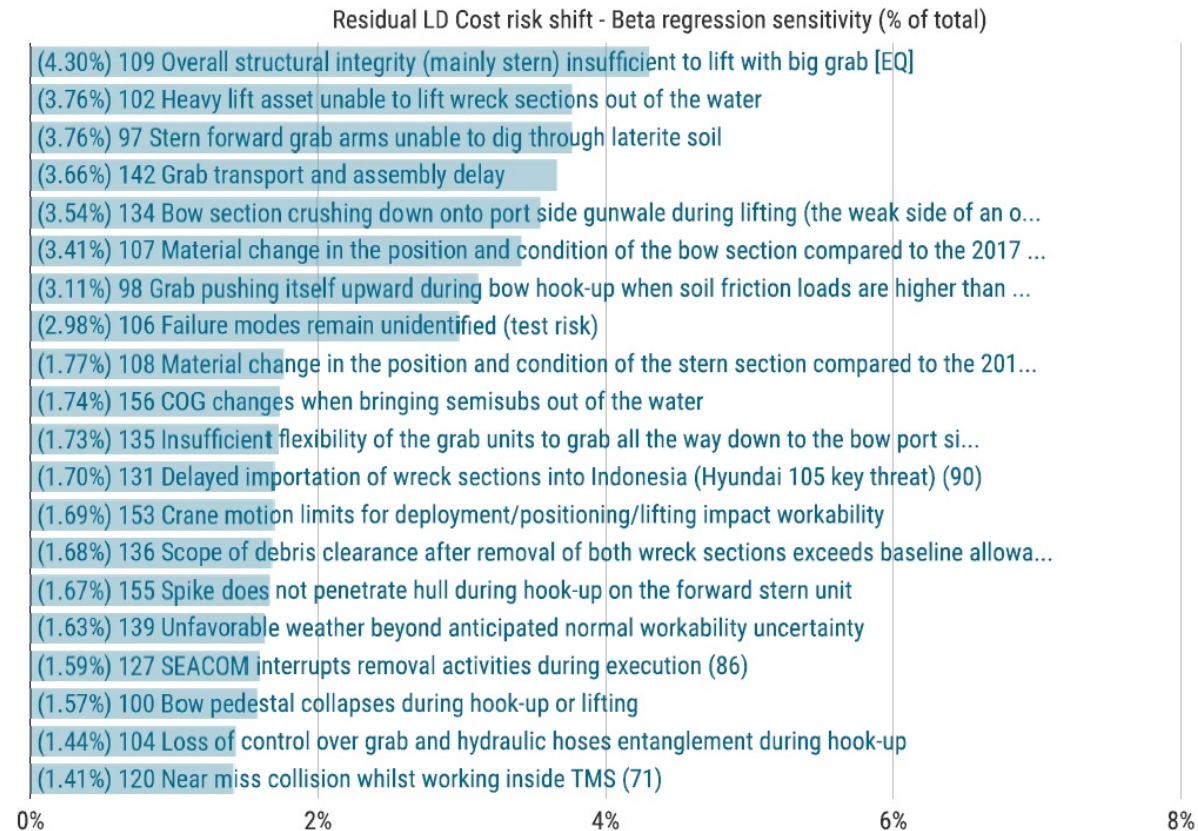


Figure 2 - xpoSure Risk Forecast Sensitivity Analysis

Risk Based Contracting

The current QRA process typically uses a BIMCO WRECKSTAGE 2010 (WRECKSTAGE) contract with Clause 4 (Change of Circumstance) and Clause 7 (Delays) deleted. To protect the now exposed contractor, Clauses 4 and 7 are replaced by additional clauses to deal with specific risks handed back to the insurer or risks that are shared between the contractor and the insurer. For example, an additional clause for the Hurricane Risk discussed above might include a timeline for the contractor to demobilize if a hurricane is approaching with milestones at 120 hours, 96 hours, 72 hours etc. The clause can include a tiered standby rate for the times when the contractor is limited or shut down due to the hurricane's impact and a timeline for getting back to work. This is discussed and agreed during the contractor interviews. In one instance, a category five hurricane did pass close by the work site. While the impact to the community was devastating, it was a non-event contractually.

Other risks that have been handled with additional clauses include but are not limited to:

- Subcontractor Interface Risks where the subcontractor's performance is significant to the project, particularly when the contractor has bid lump sum and the subcontractor is on a day rate.
- Exclusion Zone Risk to deal with safety issues when working in areas with high vessel traffic density (e.g. Singapore Straits).
- Quantity Risk for dealing with unknown quantities of hazardous waste for recovery.
- Quality Risk for dealing with waste that has not yet been characterized as hazardous or non-hazardous
- Environmental Risk for a potential oil spill which, like the Hurricane Risk, is accepted by the insurer and mitigated by contractor.

- Government Intervention Risk for working in a jurisdiction where the local authorities have a history of stopping work for unjustifiable reasons.
- Bribery Risks for the possibility that the contractor is caught paying bribes and the project delayed or shut down, including reputational risks for the insurer/owner.

Other forms of contract can be used. In one instance, a bespoke contract was written for a multilateral tripartite agreement between two contractors and the insurer.

Final Terms and Conditions

The phrase “... *subject to final terms and conditions*” is included in just about every proposal and rightly so if things are not finalized in the contractor’s tendered proposal. The problem is that things can change between submittal and final contracting. This can leave the insurer in a tough negotiating position when, for example, the preferred contractor is sitting in front of them and the project must start imminently before the monsoon season begins. On the other hand, if the contractor is not short listed, it is possible that they will never have a chance to put their best and final offer on the table. The QRA process addresses many of the contractual issues before the contractors submit their final offer. The contractual issues are discussed, additional clauses are agreed and it is all included in the Risk Register and the Risk Forecast.

The ITT also requests the Contractor to provide the exact wording for the relevant boxes and Annexes in the WRECKSTAGE contract including but not limited to:

- Box 5 – Condition of the Vessel
- Box 6 – Position of Vessel and Condition of the Worksite
- Box 7 – Nature of Services
- Box 8 – Place of Delivery and/or Disposal of Vessel
- Box 15 – Weather Delays
- Annex 1 – Schedule of Personnel, Craft and Equipment
- Annex 2 – Method of Work and Estimated Time Schedule

Many of the project risks are reflected in the contents of these boxes and it is important that they be worded correctly. Additional risks are often identified when the specific wording is being discussed in the contractor interviews. The parties will never know their overall exposure until they know what will be in these boxes. That is precisely why the QRA process requires this wording to be agreed and included as part of the contractor’s final offer. This gives both sides more certainty leading into final contract negotiations.

Once the final wording has been agreed and the additional clauses have been crafted, the contractor is requested to propose a lumpsum offer that includes their Baseline Costs plus a Risk Premium at levels they choose. The Contractor can be as creative as they wish in making their final proposal. For example, a contractor may propose to do a job at cost with an agreed bonus for the successful completion of the job. This can easily be accommodated in the Risk Forecast and this forecast can easily be compared, in terms of the insurer’s overall expose, with other contractors who might be inclined to bid on an agreed lump sum–staged payment basis.

Company Risk Register

When the contractor hands back a risk to the insurer, the risk does not disappear from the project or from the contractor’s overall proposal. After the bids are received, a Company Risk Forecast is run for each of the contractors. This forecast includes the contractor’s timeline, costs and all the risks that have been shared or transferred back to the insurer. The Company Forecast provides the insurer with a metric of their overall exposure for each contractor in terms of time, costs and risks. It is the Company Risk Forecasts that the insurer uses to compare the various proposals and select the contractor that minimizes their overall exposure (contractor risks + (re)insurers risks). It is the insurer’s overall exposure, and not necessarily the contractor’s bid price, that determines which contractor is selected. The lowest qualified lumpsum bidder does not necessarily win.

Insurer's Due Diligence

Insurers are coming under increasing pressure in a hardening insurance market to show their due diligence in contractor selection and to achieve more certainty in the contracts they sign. Claims handlers must explain their selection process to the Senior Claims Manager who must sell the final selection and contract to the Directors. In pool claims the P&I Club must justify their contractor to the International Group (IG) and, in extreme cases, the Club must defend the contracts they sign to the re-insurance market. The Risk Forecasts are an excellent tool for achieving this level of compliance with fair value reporting requirements under Solvency.

While useful during contractor selection and subsequent contract negotiations, QRA is more broadly a project management tool to be used throughout the execution of the project. Monthly Risk Forecasts should be tied into detailed engineering, work preparations and updated throughout project execution with risks that have expired being eliminated from the Risk Register, new risks being added and any changes to the Methodology and Baseline Schedule being incorporated. This is proper risk management and gives all stakeholders a valuable measure of where the project stands at any given moment. This has proven to be very helpful for P&I Club's when giving updates to the other IG members on a pool claim or to reinsurers when necessary, including a full prediction of future payments (Cashflow Forecasts).

There have been criticisms that the QRA process takes too long and is relatively expensive for the insurer. This is not necessarily true as the time and cost to run a tender and sign a contract can be impacted by many things that have nothing to do with the process. The administrative costs and the time from ITT to contract signing using the QRA process are not necessarily different than current practices. The QRA process does require more upfront work from both sides but the results are more useful in contractor selection and include a large part of the contract negotiations. The overall reduction in costs for the insurer have more than paid for the costs of the CMT over the lifetime of the project where QRA has been applied.

It is the insurer's responsibility to ensure that the ITT provides adequate information on the casualty and the worksite. Vague information or unknowns will push the contractors away from a lumpsum proposal or increase the quantity and severity of the risks unnecessarily. The costs of a thorough pre-ITT survey are justified by the reduction in risk due to the information gathered during the survey.

What's in this for the Contractor?

Contractors are always disappointed when they spend significant time and money to prepare a tender, submit it and never have the chance to discuss their proposal with the insurer. In contrast, the QRA process incorporates at least two CMT interviews with each contractor prior to the contractors submitting their final offer. The first interview is often conducted without requiring the contractor to worry about costs. The focus is simply on refining the methodology and improving the timeline. The preliminary forecast resulting from the first interview is limited to time without costs. It is a very useful tool for the contractor to determine how the risks affect their proposal in terms of time, how they might better mitigate the risks and determine if they need to modify or change their methodology to reduce the risks.

Baseline Costs are introduced in the subsequent interviews. The Risk Forecast now includes both time and costs. The same internal review process can now be done with the contractor focusing on the tasks that have the biggest impact on both time and costs (See Figure 2). While we might all agree that time is money, the risk that has the biggest impact on time does not necessarily have the biggest impact on costs. The contractor can use this forecast to justify changes to any part of their proposal during the interviews, between the interviews and up until the time of submittal; they often do.

The interview process gives the contractor multiple opportunities to convince the insurer they are "*the best contractor for this project*" and to learn what is important from the insurer's perspective. These exchanges are beneficial to both sides. The back and forth between the CMT and the contractor has, in every instance, raised important questions and discovered additional risks. These discussions consistently lead to an improved proposal, fewer surprises and a better relationship between the parties during contract negotiations and project execution. Contractors should view the interviews as a golden opportunity to plead their case to their client.

This face-to-face interaction between the contractor and the insurer does not normally occur in a more traditional tender. There is little or no contact before final offers are submitted and contractors can only hope for a meeting if they are short listed. The short list interviews are mostly contract related and the discussions do not facilitate the kinds of detailed plan review necessary for the contractor to properly manage the execution of the project or the insurer to understand their overall exposure.

Another particular concern expressed by contractors is that the interview process gives away too many secrets and that the CMT has too many opportunities to pass their advantages onto the other contractors, either intentionally or unintentionally. This is the reason why contractors will always maneuver to be the last interviewed. It can be challenging for the CMT not to inadvertently disclose one contractor's ideas with another during the interviews. The CMT must remain cognizant of this and be diligent in making sure this does not happen. All members of the CMT must work constantly to earn the trust of the contractors. It only takes one bad member to destroy the contractor's confidence in the CMT and the QRA process as well. That the consultants involved be trustworthy is equally true regardless of the method used to select a contractor.

Contractors are sure to ask, "*But what if something happens during project execution that is not covered in the Risk Register?*" It is a valid question if you are a contractor being asked to sign a WRECKSTAGE contract without Clause 4 or Clause 7. The first level of protection is, of course, a thorough and detailed Risk Register which is representative of the project's intrinsic risks. It is possible to develop a very comprehensive Risk Register if done rigorously and transparently. This is a responsibility, and in the best interest, of both the contractor and the insurer. The second level of protection could be the inclusion of a carefully worded Force Majeure type clause to protect the Contractor from unforeseen risks that are out of their control. The last level of protection is the contractor's perception of the complexities of the project, a perception which is enhanced by the Risk Register itself. If the contractor is not confident in the information provided in the ITT, their own Methodology, their own Mitigation Strategies or their Risk Forecast, they are free to be more commercially creative in their commercial offer or to ask a higher price. In this respect, the QRA process is not really any different than a more subjective method of contractor selection and contract negotiations.

The QRA process retains the competition amongst the bidders. Competition keeps them from scoring risks too high or unjustifiably inflating their Risk Premium. It does not prevent a contractor from taking all the risks for a ridiculously low lumpsum price. This might have been a winning, if not profitable, strategy in the past. Now such an offer might be considered as a risk for the insurer in the Company Risk Forecast for that contractor and tilt the final selection towards a contractor with a higher price but lower overall exposure for the insurer. The QRA process provides more protection, to both the contractor and the insurer, than a more subjective and less rigorous process. It is not the QRA process that threatens to put contractors out of business.

Contractors may unilaterally choose to complete the QRA process even if it is not called for in the ITT. The resulting Risk Forecast can be used by the contractor to show the insurer the risks that they have considered, a quantified justification for their commercial offer and a measure of certainty for their proposal. They can then use the QRA process to manage their project execution and offer regular project updates to the insurer during the execution of the project.

Lastly, an upgrade to xpoSure is coming. The new version should be more user friendly and forecasts can be calculated in real-time. Until now, the Risk Engineer has had control over the modelling and the production of the Risk Forecast. The intent is that the contractors will now be able to review, use and improve the Risk Engineer's models. Contractors can even model their own proposals and produce their own forecasts from scratch. The Risk Engineer will review the contractor's input and provide assistance as needed. This will give the contractors the ability to compare different methodologies, risk scores and combinations of risk sharing with the insurer before making their final offer. This will eliminate contractor concerns over what the Risk Engineer has done on their behalf and give them more confidence in their Risk Forecast and their final offer.

Summary

The QRA process is the same game played by slightly different rules. Commercial managers will find the process a challenge but will learn to manipulate the process as they always have. Proposals will be improved and operations will be better managed. Contractors will have the protections they deserve. Insurers will have more certainty. The process is good for all stakeholders.

Reed Maritime and CL Risk Solutions are both available to discuss QRA and Risk Based Contracting. This can be done remotely or in person. We would be happy to prepare a presentation or have a simple discussion and Q&A session. You can contact the author at (<https://reedmaritime.com/contact/>).